इंटरनेट मानक

Disclosure to Promote the Right To Information

Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

“जानने का अधिकार, जीने का अधिकार”
Mazdoor Kisan Shakti Sangathan
“The Right to Information, The Right to Live”

“पुराने को छोड नये के तरफ”
Jawaharlal Nehru
“Step Out From the Old to the New”

IS 13849 (1993, Reaffirmed 2008): Portable Fire Extinguisher, Dry Powder Type (Stored Pressure)--Specification. UDC 614.845.1

“ज्ञान से एक नये भारत का निर्माण”
Satyanarayan Gangaram Pitroda
“Invent a New India Using Knowledge”

Act Number 22 of 2005
The Indian Parliament
RIGHT TO INFORMATION

Made Available By
Public.Resource.Org

“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”
Bhartṛhari—Nītiśatakam
“Knowledge is such a treasure which cannot be stolen”

(Reaffirmed 2008)

IS 13849 : 1993
(Reaffirmed 1998)

भारतीय मानक

सुवाह्य अग्नि शामक, शुष्क पाउडर टाइप (भंडारित दाब) – विशिष्टि

Indian Standard

PORTABLE FIRE EXTINGUISHER, DRY POWDER TYPE (STORED PRESSURE) — SPECIFICATION

(First Reprint OCTOBER 2001)

UDC 614·845·1

© BIS 1993

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

October 1993 **Price Group 5**

AMENDMENT NO. 1 APRIL 2001
TO
IS 13849 : 1993 PORTABLE FIRE EXTINGUISHER, DRY POWDER TYPE (STORED PRESSURE) — SPECIFICATION

(*Page* 4, *clause* **10.3.1**) — Delete the entire clause.

[*Page* 4, *clause* 11.1(b)] — Add the following at the end:

'Preferably illustrated with pictures.'

[*Page* 4, *clause* 11.1(l)] — Insert the following:

'l) Do not rely on partially used or discharged extinguisher.'

(CED 22)

Reprography Unit, BIS, New Delhi, India

AMENDMENT NO. 2 JULY 2001
TO
IS 13849 : 1993 SPECIFICATION FOR PORTABLE FIRE EXTINGUISHERS, DRY POWDER TYPE (CONSTANT PRESSURE)

(*Second cover page, Foreword*) — Insert the following before the last para:

'A scheme or labelling environment friendly products known as ECO-Mark has been introduced at the instance of the Ministry of Environment and Forests (MEF), Government of India. The ECO-Mark would be administered by the Bureau of Indian Standards (BIS) under the *BIS Act*, 1986 as per the Resolution No. 71 dated 21 February 1991 and No. 425 dated 28 October 1992 published in the Gazette of the Government of India For a product to be eligible for marking with ECO logo, it shall also carry the ISI Mark of BIS besides meeting additional optional environment friendly requirements. For this purpose, the Standard Mark of BIS would be a single mark being a combination of the ISI Mark and the ECO logo Requirements to be satisfied for a product to qualify for the BIS Standard Mark for ECO friendliness being included in the relevant published standards through an amendment. These requirements are optional, manufacturing units are free to opt for the ISI Mark alone also.

The amendment is based on the Gazette Notification No 160 dated 1 April 1999 for fire extinguishers as environment friendly products published in the Gazette of the Government of India '

(*Page* 4, *clause* **10..5.1**) — Insert the following new clauses after 10.5.1 and renumber the subsequent clauses:

11 OPTIONAL REQUIREMENTS FOR ECO-MARK

11.1 General Requirements

11.1.1 Any fire extinguisher having BIS Standard Mark qualifies for consideration of ECO-Mark.

11.1.2 The products manufacturer must produce the consent clearance as per provision of the *Water (Prevention and Control of Pollution) Act*, 1974, *Water (Prevention and Control of Pollution) Cess Act*, 1977 and *Air (Prevention & Control of Pollution) Act*, 1981 respectively, along with authorization if required under *Environment (Protection) Act*, 1986, and the Rules made thereunder to the Bureau of Indian Standards while applying for ECO-Mark.

11.1.3 The products may display in brief the criteria based on which the product has been awarded ECO-Mark.

11.1.4 The product may carry alongwith instructions for proper use so as to maximize product performance with statutory warning, if any, minimize waste and method of safe disposal.

11.1.5 The material used for product packaging (excluding refills) shall be recyclable, reusable or biodegradable.

11.1.6 The product must display a list of critical ingredients in descending order of quantity present in percent by weight. The list of such critical ingredients shall be identified by the Bureau of Indian Standards.

11.2 Specific Requirements

11.2.1 The fire extinguisher shall not contain any ozone depleting substance (ODS) relevant to fire extinguishers industry as identified under the Montreal Protocol (*see* Annex A).

11.2.2 Gas based extinguishing media once discharged in the atmosphere should not have atmospheric life time of more than a year (*see* Annex B).

11.2.3 Chemical used should not have global warming potential (*see* Annex C).

11.2.4 The metallic body and other metal parts of the fire extinguishers shall be free of lead or lead alloys.

11.2.5 The coating used for the metallic part shall not be formulated with mercury and mercury compounds or be tinted with pigments of lead, cadmium, chromium VI and their oxides. Excluded are natural impurities entailed by the production process up to the amount 0 1 percent by weight which are contained in the raw material.

NOTE — CO_2 extinguishers may be permitted till suitable substitutes are available.

ANNEX A

(*Clause* 11.2.1)

LIST OF OZONE DEPLETING SUBSTANCES (ODS) CONTROLLED BY MONTREAL PROTOCOL

Trade Name	*ODP*
Halon 1211	3.0
Halon 1301	10.0
Halon 2402	6.0
CFC-11	1.0
CFC-12	1.0
CFC-113	0.8
CFC-114	1.0
CFC-115	0.6
CCl_4	1.1
$C_2 H_3 C_{13}$	0.1
CFC-13	1.0
CFC-111	1.0
CFC-112	1.0
CFC-211	1.0
CFC-212	1.0
CFC-213	1.0
CFC-214	1.0
CFC-215	1.0
CFC-216	1.0
CFC-217	1.0
Methyl bromide	0.6

NOTE — ODP values are relative to CFC-11 which has been assigned arbitrary value of 1.0.

ANNEX B

(*Clause* 11.2.2)

LIST OF ATMOSPHERIC LIFE TIME OF GAS-BASED AGENTS

Trade Name	*Designation*	*Atmospheric Life Time (Year)*
Halon-13001	(CF 31)	<1 day
NAFS III	HCFC (Blend A)	12
FE 25	HCFC-125	36
FE 241	FCFC-124	6
FE 36	HFC-227 fa	250
FE 13	HFC-23	250
FM 200	HFC-227 EA	41
CEA 410	FC-3-1-10	2 600
Halon 1301	Halon 1301	65
Inergen	IG 541	—
Argonite	IG 55	—
Argon	IG 01	—

ANNEX C

(*Clause* 11.2.3)

LIST OF SUBSTANCES HAVING GLOBAL WARMING POTENTIAL (GWP)

Trade Name	*GWP (100 year)* V_s CO_2
Halon 1301	5 600
Inergen	—
Argonite	—
Argon	—
CEA 410	5 500
FM 200	3 300
FE 13	12 100
FE 36	8 000
FE 241	480
FE 25	3 200
NAFS III	1 450
CF 31	<5

(CED 22)

Reprography Unit, BIS, New Delhi, India

AMENDMENT NO. 3 FEBRUARY 2003
TO
IS 13849 : 1993 PORTABLE FIRE EXTINGUISHER, DRY POWDER TYPE (STORED PRESSURE) — SPECIFICATION

(*Page* 1, *clause* 4, *line* 3) — Insert 'for BC or IS 14609 for ABC' after 'IS 4308 : 1982'.

[*Page* 1, *Table* 1, *Sl No.* (viii)] — Insert the following in columns 3 and 4:

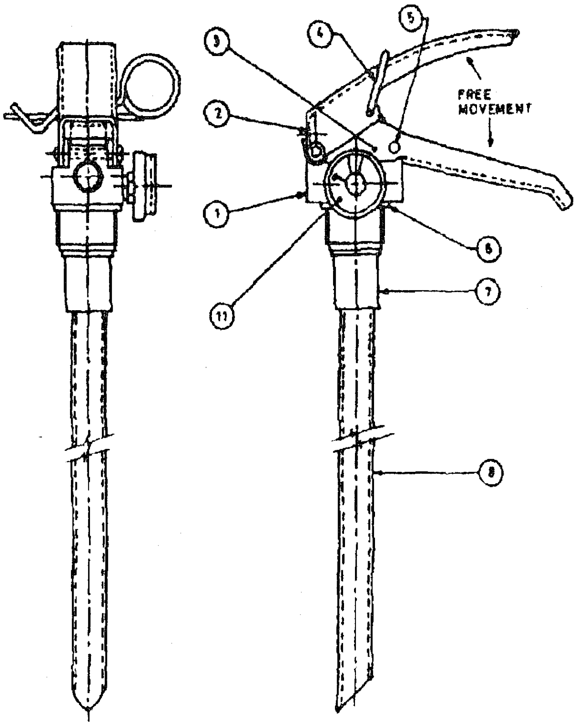
(3)	(4)
Plastic	IS 7328

(*Page* 3, *clause* **7.4**) — Insert the following at the end of the clause:

'Valve shall be as per Fig. 1.'

(*Page* 4, *clause* **10.5.2**) — Insert the following new clause after **10.5.1**:

'**10.5.2** Fire knock down properties shall be carried out on powder filled inside the extinguishers as per the procedure given in **3.7** of IS 4308 or **4.12** of IS 14609, depending upon the powder used in fire extinguisher.'



1 — Head
2 — Trigger
3 — Handle
4 — Pull pin
5 — Spring pin ϕ 4 × 30
6 — Seal O-ring
7 — Syphon tube adopter
8 — Syphon tube
9 — Spring — compression
10 — Valve stem assembly
11 — Pressure indicator 100 kPa

FIG 1 SQUEEZE GRIP VALVE — ASSEMBLY

(CED 22)

Reprography Unit, BIS, New Delhi, India

AMENDMENT NO. 4 SEPTEMBER 2003
TO
IS 13849 : 1993 PORTABLE FIRE EXTINGUISHER, DRY POWDER TYPE (STORED PRESSURE) — SPECIFICATION

(*Page* 2, *clause* 7.1, *line* 19) — Insert '10 kg capacity extinguisher may also be without longitudinal seam' after 'welding'

(*Page* 2, *clause* 7.1.1) — Substitute the following for the existing

'**7.1.1** The body shall have a measured wall thickness greater than the minimum thickness calculated using the following formula

$$S = \frac{D}{300} + K$$

where

S = minimum thickness, in mm, and

D = the external diameter of the body, or the largest external measurement normal to the longitudinal axis in mm '

(*Page* 2, *clause* 7.1.2) — Substitute the following for the existing

'**7.1.2** For austentic steel bodies, the minimum thickness measured shall be greater than the minimum thickness calculated using the following formula

$$S = \frac{D}{600} + K$$

where

S = minimum thickness in mm,

D = external diameter of the body, or the largest external measurement normal to the longitudinal axis, in mm, and

K = coefficient with a value of 0 30 for diameters ≥ 100 mm

This is subject to an absolute minimum thickness of 0 64 mm, including all tolerances '

(*Page* 3, *clause* 9.1) — Insert 'and 537' after '536'

(*Page* 4, *clause* **10.5.1**) — Substitute the following informal table under **10.5.1** for the existing

(1) *Capacity of Fire Extinguisher* kg	(2) *Minimum Period for which throw of jet will be maintained* s	(3) *Minimum Period to discharge at least 85 percent of contents* s	4) *Range or throw of jet*[1]
0.5	5	8	Not less than 1.5
1 and 2	8	10	Not less than 2
5	15	20	Not less than 4
10	23	30	Not less than 6

[1] From nozzle to centre of pattern of discharge

(CED 22)

Reprography Unit, BIS, New Delhi, India

AMENDMENT NO. 5 MARCH 2005
TO
IS 13849 : 1993 PORTABLE FIRE EXTINGUISHER, DRY POWDER TYPE (STORED PRESSURE) — SPECIFICATION

[*Page* 1, *Table* 1, *Sl No* (i) *and* (ii), *col* 3 *and* 4] — Insert the following

(1)	(3)	(4)
i)	b) Stainless steel sheet	IS 6911
ii)	b) Stainless steel	IS 6913

(*Page* 2, *clause* **7.1.1**) — Add the following at the end of clause

'K — coefficient with a value of

0.45 for $D \leq 80$ mm,
0.50 for $D > 80$ mm and ≤ 100 mm,

0.70 for $D > 100$ mm.'

(*Page* 3, *clause* **8.1**) — Substitute the following for the existing

'**8.1** All internal and external surfaces of the body shall be completely epoxy powder coated to minimum 0.050 mm thickness. The thickness of the coating shall be measured as given in IS 3203. The internal surface of the body shall be plastic/rubber coated and lining shall be of a minimum thickness of 0.5 mm as an alternative to powder coating.

8.1.1 *Test for Adhesion of Plastic Lining (Type Test)* — Subject the unfilled extinguisher to a pressure 15 kgf/cm^2 and store for $120\ ^{+4}_{\ 0}$ h at $27 \pm 5^\circ$C.

Release the pressure and examine the extinguisher internally for cracking, separation from the wall of the body or lifting of the lining, and bubbles between the lining and the body.'

(*Page* 3, *clause* **8.2**) — Delete 'to tin-lead alloy coating'

(*Page* 3, *clause* **9.1**) — Insert 'or Post Office Red' after 'fire red' and 'or No 538' after 'No 536'

(*Page* 3, *clause* **10.3**) — Substitute the following for the existing

'**10.3 Leakage Test** – A suitable viscosity soap solution be applied with the help of a brush to all the joints and fittings of extinguishers charged with extinguishing medium and pressurized at 12 kgf/cm^2. It is to be visually observed for 10 min for any bubbling.'

[*Page* 4, *clause* **10.5.2** (*see also Amendment No* 3)] — Delete

(CED 22)

Reprography Unit, BIS, New Delhi, India

AMENDMENT NO. 6 AUGUST 2006
TO
IS 13849 : 1993 PORTABLE FIRE EXTINGUISHER, DRY POWDER TYPE (STORED PRESSURE) — SPECIFICATION

(First Revision)

[*Page* 4, *clause* 11 (*see also Amendment No.* 1)] — Substitute 'ADDITIONAL' *for* 'OPTIONAL'.

(CED 22)

Reprography Unit, BIS, New Delhi, India

AMENDMENT NO. 7 AUGUST 2007
TO
IS 13849 : 1993 PORTABLE FIRE EXTINGUISHER, DRY POWDER TYPE (STORED PRESSURE) — SPECIFICATION

(*Page* 3, *clause* 7.5.2) — Insert the following at the end of clause

'STORED Braided rubber/plastic hose (5 and 10 kg only) shall be having bursting pressure not less than 50 kg/cm^2

(CED 22)

Reprography Unit, BIS New Delhi, India

AMENDMENT NO. 8 JULY 2008
TO
IS 13849 : 1993 PORTABLE FIRE EXTINGUISHER, DRY POWDER TYPE (STORED PRESSURE) — SPECIFICATION

[*Page* 1, *clause* 2 (*see also Amendment No.* 2)] — Substitute the following for the existing:

2 REFERENCES

The standards listed in Annex D contain provisions, which through reference in this text, constitute provisions of this standard. At the time of publication of this amendment, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated in Annex D.

[*Page* 5, *Annex* D (*see also Amendment No.* 2)] — Substitute the following for the existing:

IS No.	*Title*
5 : 2004	Colours for ready mixed paints and enamels (*fifth revision*)
513 : 1994	Cold-rolled low carbon steel sheets and strips (*fourth revision*)
1545 : 1994	Solid drawn copper and copper alloy tubes for condenser and heat exchangers (*third revision*)
2062 : 2006	Hot rolled low, medium and high tensile structural steel (*sixth revision*)
2171 : 1999	Specification for portable fire extinguishers, dry powder (cartridge type) (*fourth revision*)
2643 : 2005	Pipe threads where pressure tight joints are not made on the threads — Dimensions, tolerance and designation (*third revision*)
2932 : 2003	Enamel, synthetic, exterior : (a) undercoating (b) finishing — Specification (*third revision*)

IS No	*Title*
4218 (Part 3) 1999	ISO general purpose metric screw thread Part 3 Basic dimensions (*second revision*)
4308 2003	Specification for chemical dry powder for fighting B & C class fires (*second revision*)
4454 (Part 1) 2001	Steel wires for mechanical springs Part 1 Patented and cold drawn steel wires — Unalloyed (*third revision*)
6528 1995	Stainless steel wire (*first revision*)
6912 2005	Copper and copper alloy forging stock and forgings (*first revision*)
9550 2001	Bright steel bars — Specification (*first revision*)

NOTF — Other cross referred standards listed in Annex D of the standard are valid

(CED 22)

Reprography Unit, BIS, New Delhi, India

AMENDMENT NO. 10 MAY 2009
TO
IS 13849 : 1993 PORTABLE FIRE EXTINGUISHER, DRY POWDER TYPE (STORED PRESSURE) — SPECIFICATION

(*Amendment No.* 2, *Page* 3, *Annex* A, *line* 10) — Substitute '$C_2H_3Cl_3$' *for* '$C_2H_3C_{13}$'.

(*Amendment No.* 2, *Page* 4, *Annex* B, *line* 1, *col* 2) — Substitute 'CF_3I' *for* 'CF31'.

(*Amendment No.* 2, *Page* 4, *Annex* B, *line* 4, *col* 2) — Substitute 'HCFC124' *for* 'FCFC-124'.

(*Amendment No.* 2, *Page* 4, *Annex* B, *line* 7, *col* 2) — Substitute 'HFC 227ea' *for* 'HFC-227 EA'.

(*Amendment No.* 2, *Page* 4, *Annex* B, *line* 9, *col* 2) — Substitute 'CF_3Br' *for* 'Halon 1301'.

(*Amendment No.* 2, *Page* 4, *Annex* C, *last line*) — Substitute 'CF_3I' *for* 'CF31'.

(*Page* 4, *clause* **10.5.1**, *informal table*, *col* 3) — Substitute '*Maximum Period to Discharge at Least 85 percent of Contents*' *for* the existing title.

(CED 22)

Reprography Unit, BIS, New Delhi, India

AMENDMENT NO. 11 FEBRUARY 2010
TO
IS 13849 : 1993 PORTABLE FIRE EXTINGUISHER DRY POWDER TYPE (STORED PRESSURE) — SPECIFICATION

(*Page* 3, *clause* 9.1) — Substitute the following for the existing:

"Each extinguisher body except stainless steel body shall be painted either with epoxy powder coating or synthetic enamel paint. The shade shall be 'Fire Red' or 'Post Office Red' conforming to Shades No. 536 or 538 of IS 5. Stainless steel body shall be buffed.

NOTES

1 Whenever epoxy powder coating is applied on the external surface of mild steel body for anti-corrosive treatment, synthetic enamel paint coating is not required.

2 The body of extinguisher shall be of good finish, clear of all burrs and sharp edges."

(CED 22)

Reprography Unit, BIS, New Delhi, India

Fire Fighting Sectional Committee, CED 22

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Fire Fighting Sectional Committee had been approved by the Civil Engineering Division Council

Portable dry powder fire extinguishers (other than those used for metal fires) are used for dealing Class BC and ABC fires according to their formulation of the powder filled in Use of these extinguishers has increased due to banning of CTC type fire extinguishers as these also act as a substitute for the same in certain risk The portable fire extinguishers of this type are either with gas cartridge portable or stored pressure The requirements for the cartridge type are covered in IS 2171 1985 In view of the different methods of construction for the stored pressure type this Indian Standard has been formulated

Portable fire extinguishers, dry powder type (stored pressure), in which the method of expelling dry powder is by means of nitrogen gas pressure These extinguishers are used for tackling fires involving flammable liquids, gases, live electrical equipments, wood, plastic, textiles, etc, depending on the type of powder, viz BC or ABC When extinguishers of these types are used, it is very essential to clean immediately and thoroughly the articles or the equipments, on which these fire extinguishers are discharged This type of fire extinguisher has certain advantages over other dry powder type fire extinguisher (with cartridges), in its capability of easy operation. Presence of pressure gauge will facilitate checking of its serviceability

The committee responsible for the preparation of this standaid is given in Annex D

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the results of a test or analysis, shall be rounded off in accordance with IS 2 . 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

PORTABLE FIRE EXTINGUISHER, DRY POWDER TYPE (STORED PRESSURE) — SPECIFICATION

1 SCOPE

This Indian Standard lays down the requirements regarding material, shape, capacity, construction, anti-corrosive treatment and tests for portable dry powder type fire extinguisher (stored pressure) for class BC or ABC fires, of capacities 0·5, 1, 2, 5 and 10 kg.

2 REFERENCES

The Indian Standards listed in Annex A are necessary adjuncts to this standard.

3 PRINCIPLE

The method of expulsion of dry powder is by dry nitrogen pressure stored in the fire extinguisher itself. The extinguisher shall be designed for operating in the upright position, fitted with squeeze grip valve. It is operated by holding upright, removing the locking pin or seal or safety device from the valve handle by pressing down the spring loaded spindle by the operating handle. The controlled discharge of the dry powder is obtained by use of the squeeze grip.

4 CAPACITY

4.1 The total capacity of the extinguisher when filled with dry powder conforming to IS 4308 : 1982 for the various capacities shall be as follows:

Nominal Capacity (kg)	*Dry Powder Content* (kg, *Min*)	*Tolerance by Mass*
0·5	0·5	± 5 %
1	1	± 5 %
2	2	± 3 %
5	5	± 2 %
10	10	± 2 %

4.2 The extinguisher shall be pressurised either using dry nitrogen in accordance with IS 1747 : 1972 or by using dry air having maximum water content of expellent as 0·006 %. Maximum charging pressure for the expellent shall not exceed 15 kgf/cm².

5 MATERIALS

5.1 For all capacities material used for manufacturing the fire extinguisher and its components shall be as given in Table 1.

Table 1 Materials of Construction of Various Parts of Fire Extinguishers

(*Clause* 5.1)

Sl No.	Component	Material	Relevant IS No.
(1)	(2)	(3)	(4)
i)	Body	Mild steel sheet	IS 513 1986
ii)	Neck ring	Mild steel	a) IS 2062 1992 b) IS 1875 . 1992
iii)	Valve body	a) Forged brass	FLB — IS 6912 : 1985
		b) Leaded bronze	Grade LTB-2 of IS 318 · 1981
		c) Plastic	Conforming to requirements given in Annex C
iv)	Washers and O rings	Rubber	Requirements in respect of hardness as applicable to type 3 of IS 5382 : 1985 and also acid/alkali resistant (*see* Note)
v)	Spindle	a) Brass	a) Grade 2 of IS 291 : 1989 b) Type 1 of IS 319 : 1989
		b) Stainless steel	IS 6528 : 1972
vi)	Spring	Spring steel (plated)	Grade 1 of IS 4454 (Part 1) : 1981
vii)	Syphon tube sheet	a) Brass	Alloy No. 2 of IS 407 : 1981
		b) Copper	IS 1545 : 1982
viii)	Nozzle	a) Plastic	Conforming to requirements given in Annex C
		b) Brass	Grade 2 of IS 291 : 1989 or type 1 of IS 319 : 1989
ix)	Hose (only for 5 and 10 kg)	Braided rubber or Braided PVC	Shall have a minimum bursting pressure of 50 kgf/cm² (5 MN/m²)

NOTE — When a piece of 2·5 cm cut from any portion is dipped in 20% sulphuric acid, 5% sodium hydroxide solution for 10 minutes, there shall be no sign of corrosion or damage.

6 SHAPE

The shape of the body shall be cylindrical. The size of filler opening shall not be less than 20 mm.

7 CONSTRUCTION

7.1 The cylinder shall be of welded construction having cold or hot drawn cylindrically portion with hemi-spherical, ellipsoidal or torispherical ends welded to it or two halves cold or hot drawn and circumstantial welded together. The ends or dished part shall be having hemi-spherical, semi-ellipsoidal or tori-spherical shape and the end shall have cylindrical skirt or parallel portion of minimum 10 mm length or three times the shell thickness, whichever is greater. The welding shall be done by an electric arc welding process and shall conform to IS 2825 : 1969 and if radiographed, shall confoim to IS 817 : 1966, there shall not be any longitudinal seam in the cylinder and more than one circumferential seem up to 5 kg capacity and above 5 kg capacity the shell may be cold or hot drawn with a longitudinal welding. The thickness of the shell and ends shall be calculated in accordance with **7.1.1**. But it shall be not less than 1·60 mm up to 5 kg capacity and 2·0 mm above 5 kg capacity. The neck ring shall be welded with the body of the cylinder and shall be threaded to suit the type of valves thread. The threads shall be in accordance with class A of IS 2643 (Part 1) : 1975.

7.1.1 The minimum thickness is calculated from the following formulae:

a) For cylindrical portion

$$t = \frac{ph \times Do}{200 \times 0{\cdot}8\, JR_e + ph} = \frac{ph\, Di}{200 \times 0\ 8\, JR_e - ph}$$

b) For tori-spherical part or end

$$t = \frac{ph\, Do}{200 \times 0{\cdot}8\, JR_e + ph} \times \frac{k_z}{5}$$

c) For semi-ellipsoidal part or end

$$t = \frac{ph\, Do}{200 \times 0\ 8\, JR_e + ph} \times \frac{k\,(\,0\ 65 + 0\ 1\, k\,)}{4}$$

where

t = calculated minimum wall thickness of cylindrical shell in mm from bursting point of view;

ph = test pressure above atmosphere kgf/cm²;

Di = inner diameter in mm;

Do = outer diameter in mm;

J = weld joint factor (0·9);

R_e = yield strength in kgf/mm² (given in relevant Indian Standards);

H = depth of dishing in mm;

k = ratio D_0/H;

r = knuckle radius in mm ($r \geqslant 0{\cdot}1$);

R = dishing radius in mm ($R \leqslant D_0$); and

$$z = \left\{ \frac{\dfrac{20r}{H} + 3}{\dfrac{20r}{R} + 1} \right.$$

7.1.2 Stress may be determined from the following:

a) Cylindrical container walls $S = \frac{pd}{2t}$

b) Ellipsoidal dome or bottom $S = \frac{pD}{2t}$

c) Hemi-spherical dome or bottoms $= \frac{PL}{2t}$

d) Tori-spherical dome or bottom

$$S = \frac{0{\cdot}885\, PL}{2t}$$

where

t = Thickness of the shell in mm,

p = Proof test pressure in kgf/mm² (proof test pressure is three times the pressure to which fire extinguisher is initially charged at 21°C or the one and half times the pressure developed at 49°C),

S = Stress at proof test pressure kgf/mm²,

D = Inside diameter (dome or bottom) in mm,

d = Inside diameter (cylindrical portion of shell) in mm, and

L = Inside spherical radius or dish radius in mm.

7.1.3 The top and bottom of dry powder fire extinguisher (stored pressure) shall have a thickness after forming equal to or greater than the minimum wall thickness of the cylinder unless the dome or bottom is formed integral with the cylinder. In the case of integral dome and bottom, the thickness of the cylinder shall not be more than 15% than that of the dome or bottom.

7.2 Gas Space

A gas space shall be provided above the dry powder level in the body of the extinguisher, which shall be of sufficient volume to ensure that when subjected to operation, it meets the requirements of performance test as given in **10.5**.

7.3 Neck Ring

The neck ring shall be suitable threaded either externally or internally in accordance with class 'A' of IS 2643 (Parts 1 & 2) : 1975 or IS 4218 (Part 3) : 1976. It shall have the filler opening size as specified in **6**. The threaded length shall not be less than 16 mm.

7.4 Valve

The screw thread of the valve shall be in accordance with class 'A' of IS 2643 (Part 1) : 1975 or IS 4218 (Part 3) : 1976 for a minimum length of 16 mm to suit the thread of the neck ring.

The squeeze grip valve assembly with a spring loaded pressure sealed sliding spindle shall be provided in such a way that it is operated by manual depression by means of a cantilever pivoted grip lever. The spindle shall be so designed that the operation of the extinguisher can be regulated by means of depressing and releasing the extinguisher queeze grip handle. A safety pin/seal shall be provided to prevent inadvertent operation by accident.

7.5 Discharge Fittings

7.5.1 *Nozzle*

The discharge nozzle shall be screwed to the valve body/hose or it can be an integral part of the valve body. The design of the nozzle and its orifice shall be such that it meets the performance requirements as given in **10.5**.

7.5.2 *Hose*

The extinguishers with capacity of 5 and 10 kg shall be fitted with the hose of 500 mm (with 10 mm minimum ID) and 750 mm (with 12·5 mm minimum ID) lengths respectively.

7.5.3 *Pressure Gauge*

Except for 1/2 kg extinguisher a suitable pressure gauge shall be fitted to valve assembly or to the cylinder to know the amount of pressure inside the cylinder. The gauge dial shall indicate the operating pressure range of the extinguisher preferably with the colour code. The zero charging and maximum indicated pressure shall be shown in numerable and marked to ensure the correct charging of pressure.

7.5.4 *Syphon Tube*

The syphon tube shall be fitted with the discharge valve assembly by means of a press fit type, soldering brazing or suitable threads in accordance with IS 2643 (Part 2) : 1975. The syphon tube shall not be completely disengaged during use, syphon tube shall be notched, or otherwise prevented from restricting the discharge in an unintended manner.

8 ANTI-CORROSIVE TREATMENT

8.1 All internal and external surface of the body shall be completely coated with lead-tin alloy (tin not less than 10%) by means of hot dipping or by electrolytic process to a thickness not less than 0 012 mm. The thickness of the coating shall be measured as given in IS 3203 : 1982. Epoxy powder coating can also be used for anti-corrosive treatment with 0·050 mm thickness.

8.2 Phosphating in accordance with the provision of IS 3618 : 1966 may be applied on the external surface of the body as an alternative to tin-lead alloy coating

9 PAINTING

9.1 Each extinguisher shall be painted with fire red conforming to shade No. 536 of IS 5 : 1978. The paint shall conform to IS 2932 : 1974.

9.2 A picture showing operation of the extinguisher in the correct manner shall be shown on the body/label of the extinguisher.

9.3 The extinguisher shall be marked with letter 'BC' or 'ABC' indicating their suitability for respective classes of fires as laid down in IS 2190 : 1992. The size and colour of the letter A, B and C and the size and colour of square and circle shall be in accordance with IS 2171 · 1985.

10 TEST REQUIREMENTS

10.1 Hydrostatic Pressure Test

The extinguisher body and valve assembly shall be capable of withstanding the internal hydraulic pressure of 3 0 MN/m^2 (30 kgf/cm^2) without rupture, leakage or visible distortion for a period of 2 minutes. This test shall be carried out before the extinguishers are coated for anti-corrosive treatment and painting.

10.2 In case of ultimate failures test, the mechanical failure shall not occur at the pressure of less than 4·5 MN/m^2 (45 kgf/cm^2).

10.3 Leakage Test

The extinguisher's valve assembly after being covered by inverted glass-transparent-jar shall be dipped in suitable water tank filled with water, to the level more than the height of extinguisher for 24 hours, there shall not be any collection of even a single bubble on the inside top of the inverted glass jar after a lapse of 24 hours. The air bubble collected on the inside top of glass jar during the initial 6 hours shall be neglected.

10.3.1 *Retention of Pressure*

The extinguisher shall be discharged for 2 seconds and the pressure drop shall be noted. After an interval of 15 minutes, the pressure shall be noted again and there shall not be variation of more than 5 percent in the pressure drop. This test shall be conducted twice on extinguisher and mean reading shall be taken of the pressure drops which shall not be more than 5 percent. After 2 cycles of discharge, the extinguisher shell should be kept for 24 hours and drop in pressure shall not be more than 5 percent to pass this test.

10.4 Drop Test (Resistance to Shock and Mechanical Damage)

This test shall be conducted at a temperature of 27°C ± 5°C. The extinguishers shall be filled with water to 90 percent of its volume or 80 percent of dry powder of its volume and pressurized to its rated pressure. The extinguisher with its fitting shall be dropped from a height of 3 m on a concrete surface without pressure gauge, first with cylinder axis horizontal and second with cylindrical axis vertical with its head up. There shall be no leakage from the body. The leakage shall be observed by immersing the extinguisher in the water.

10.5 Performance Test

10.5.1 The extinguisher shall be capable of discharging not less than 85 percent by mass of the actual rated capacity of dry powder when the extinguisher is operated with its nozzle at an angle of 45° above horizontal line at a temperature of 27 ± 5°C in still weather conditions. The contents shall be expelled in the form of a continuous discharge which shall comply with the following requirements:

Capacity of Fire Extinguisher kg	*Minimum Period for Which Throw of Jet Will be Maintained* s	*Maximum Period to Discharge at Least 85 Percent of Contents* s	*Range or Throw of Jet*[1] m
0·5	5	8	Not less than 1·5
1 and 2	6	12	Not less than 4
5 and 10	15	25	Not less than 4

[1] From nozzle to centre of pattern of discharge.

11 MARKING

11.1 Each extinguisher shall be clearly and permanently marked with the following information:

a) Name of the manufacturer or trade mark, if any;

b) Method of operation in prominent letters;

c) The words 'Dry Powder Extinguisher' stored pressure type;

d) The capacity of the extinguisher in kg;

e) The words 'Recharge After Use';

f) A declaration to the effect that the body of the extinguisher has been tested to a pressure of 30 kgf/cm^2;

g) The words 'Keep This End Up' while using;

h) Letter indicating the suitability of the unit for various classes of fires;

j) Year of manufacture and Sl No. of the extinguisher; and

k) Class of fire, BC or ABC.

11.1.1 *Standard Marking*

Each extinguisher may also be marked with Standard Mark.

12 SAMPLING AND CRITERIA FOR CONFORMITY

The details of sampling and criteria for conformity are given in Annex B.

ANNEX A

(*Clause* 2)

LIST OF REFERRED INDIAN STANDARDS

IS No.	*Title*
5 : 1978	Colours for ready mixed paints and enamels (*third revision*)
291 : 1989	Navel brass rods and sections suitable for machining purposes (*third revision*)
318 : 1981	Leaded tin bronze ingots and castings (*second revision*)
319 : 1989	Free cutting brass bars, rods and sections (*fourth revision*)
407 : 1981	Brass tubes for general purposes (*third revision*)
513 : 1986	Cold-rolled low carbon steel sheets and strips (*third revision*)
737 : 1986	Wrought aluminium and aluminium alloys, sheet and strip for general engineering purposes (*third revision*)
817 : 1966	Code of practice for training and testing of metal arc welders (*revised*)
1545 : 1982	Solid drawn copper alloy tubes for condenser and heat exchangers (*second revision*)
1747 : 1972	Nitrogen (*first revision*)
1875 : 1992	Carbon steel billets, blooms, slabs and bars for forgings (*fifth revision*)
2062 : 1992	Steel for general structural purposes (*fourth revision*)
2171 : 1985	Specification for portable fire extinguishers, dry powder (cartridge type) (*third revision*)
2190 : 1992	Code of practice for selection, installation and maintenance of portable first-aid fire extinguishers (*third revision*)
2643 (Part 1) : 1975	Dimensions for pipe threads for fastening purposes: Part 1 Basic profile and dimensions (*first revision*)
2643 (Part 2) : 1975	Dimensions for pipe threads for fastening purposes : Part 2 Tolerances (*first revision*)
2825 : 1969	Code for unfired pressure vessels
2932 : 1974	Enamel, synthetic, exterior (a) undercoating, (b) finishing (*first revision*)
3203 : 1982	Methods of testing local thickness of electroplated coatings (*first revision*)
3618 : 1966	Phosphate treatment of iron and steel for protection against corrosion
4218 (Part 3) : 1976	ISO Metric screw threads : Part 3 Basic dimensions for design profiles (*first revision*)
4308 : 1982	Specification for dry powder for fire fighting (*first revision*)
4454 (Part 1) : 1981	Steel wires for cold formed springs : Part 1 Patented and cold drawn steel wires unalloyed (*second revision*)
5382 : 1985	Rubber sealing rings for gas mains, water mains and sewers (*first revision*)
5762 : 1970	Method for determination of melting range/temperature
6528 : 1972	Stainless steel wire
6912 : 1985	Copper and copper alloy forging stock and forgings (*first revision*)
7188 : 1974	Methods of test for cellulose acetate flakes
7283 : 1992	Hot-rolled bars for production of bright bars
8543 (Part 1/Sec 1) : 1978	Methods of testing plastics: Part 1 Characterization of polymer structure and size, Section 1 Determination of molecular mass from viscosity
9550 : 1980	Bright bars

ANNEX B

(*Clause* 12.1)

SAMPLING AND CRITERIA FOR CONFORMITY

B-0 GENERAL

B-0.1 The risk involved in failure of a fire extinguisher to work when needed is extremely large. Fire extinguishers, therefore, ought to have a high degree of reliability of performance during the entire specified period of its service. It can be achieved only through adequate design and control in all stages of manufacture and assembly.

B-1 SAMPLING

B-1.1 Lot

All portable fire extinguishers of the same type, shape, design and capacity produced by the same manufacturer from similar materials under almost identical conditions of manufacture shall be grouped together to constitute a lot.

B-1.2 Each lot shall be considered individually for the purpose of evaluation of quality in accordance with this specification.

B-1.2.1 The number of samples for testing to be taken at random from a lot and the criteria for conformity shall be as given in **B-1.2.2** and **B-1.2.3**.

B-1.2.2 From each lot a number of samples as indicated in col 2 of Table 2 shall be selected at random.

B-1.2.3 They shall be examined visually as far as possible in respect of requirements specified in **4** to **7**, **9**, **11** and then in respect of hydrostatic pressure, gas space (*see* **7.4**), corrosion test (*see* **8**), leakage and drop test (*see* **10.1** to **10.4**).

Table 2 For Lots Produced Under Quality Control System

(*Clause* B-1.2.2)

No. of Items in the Lot (1)	Sample Size (2)
Up to 25	3
26 to 50	5
51 to 100	8
101 to 200	8 percent

B-1.2.3.1 All the sample tested shall pass these tests for the lot to be declared to conform to these requirements.

B-1.2.4 In respect of performance test (*see* **10.5**), one sample shall be tested for this property and the sample shall pass this test for the lot to be declared to conform to this requirement.

B-1.2.5 In respect of bursting pressure (*see* **10.2**) type tests shall be done and these shall conform to the requirements laid down in the specification.

B-1.2.6 In the absence of a certificate from a manufacturer about conformity of specification for the various components (*see* **5.1**) and the charge (*see* **4.1**) of the quality specified in this specification, from a sample fire extinguisher, on item each shall be taken separately and examined individually in respect of the relevant requirements laid down in this specification. The lot shall be considered satisfactory if all the items satisfy the relevant requirements of this specification.

ANNEX C

(*Table* 1, *Clauses* 3 *and* 8)

REQUIREMENTS FOR PLASTIC NOZZLE AND VALVE BODY

C-1 PHYSICAL TESTS

C-1.1 From a sample of cap, requirements of following properties shall be checked

Sl No	*Property*	*Method of Test*	*Requirements*
1	Specific gravity	IS 8543 (Part 1/Sec 2) : 1979	1.25 ± 0.02
2	Melting point	IS 5762 : 1970	215 to 225°C
3	Ash content	IS 7188 : 1974	15 ± 1 percent

C-2 BURST PRESSURE TEST

C-2.1 If the sample passes the requirement mentioned in **C-1.1**, the following burst pressure test shall be done on the second sample.

C-2.2 The sample of cap shall be subject to internal hydraulic pressure of 5 MN/m^2 (50 kgf/cm^2) after blocking the plunger hole (if any). The pressure shall be built up gradually over a period of 30 seconds and maintained for one minute. There shall be no mechanical failure of cap and cap threads.

C-3 AGEING TEST

C-3.1 If the sample passes the requirement mentioned in **C-2.1** and **C-2.2**, the following tests shall be done on the third sample in the order as indicated below, and the sample shall pass all the tests.

C-3.2 Acid Resistance Test

The sample shall be submerged in 10 percent dilute hydrochloric acid for 72 hours at the temperature of 27 ± 3°C. It shall then be removed, rinsed with potable water and dried. The sample shall not show any sign of discolouration, distortion or deterioration of any kind.

C-3.3 Alkali Resistance Test

The sample shall then be submerged in 10 percent sodium bicarbonate solution for 72 hours at a temperature of 27 ± 3°C and then shall be removed, rinsed with potable water and dried. The sample shall not show any sign of discolouration, distortion or deterioration of any kind.

C-3.4 The sample shall then be screwed and unscrewed into neck ring of the fire extinguisher for 100 times (each operation). The samples shall not show any sign of damage of distortion of threads. The sample shall then be first tested for internal hydrostatic pressure of 4.5 MN/m^2 (45 kgf/cm^2) after blocking the plunger hole (if any). The pressure shall be built up over a period of 30 seconds and maintained for one minute. There shall not be any sign of leakage. It shall be then kept suspended in an oven maintaining the temperature of 60 ± 1°C for 72 hours and after removing when it attains temperature of 27 ± 3°C, it shall be kept in refrigerator at a temperature of − 5 ± 1°C for 72 hours. After this period, the sample shall be removed and when it attains the temperature of 27 ± 3°C and at its stage, it does not show any sign of discolouration, distortion or deterioration of any kind, it shall be subject to internal hydrostatic pressure test as mentioned above and there shall not be any sign of leakage. This cycle of test (that is, keeping in oven then in refrigerator and subjecting to hydrostatic pressure) shall be further repeated 2 times with a gap of 24 hours and the sample shall be observed and shall not show any sign of discolouration, distortion or deterioration besides passing the hydrostatic pressure test.

C-3.5 UV Exposure Test

The sample shall then be exposed at 27 ± 3°C to xenon arc UV radiations for 100 minutes followed by exposure at a RH of 60 ± 5 percent and temperature 62 ± 5°C for 20 minutes. The cycle shall be repeated 60 times and the cap shall then be subjected to internal hydrostatic pressure mentioned in **C-3.4** and shall pass the requirement.

ANNEX D

(Foreword)

COMMITTEE COMPOSITION

Fire Fighting Sectional Committee, CED 22

Chairman	*Representing*
Fire Adviser	Ministry of Home Affairs
Members	
Asstt Inspector General (RPSF) Asstt Security Officer (*Alternate*)	Ministry of Railways
Shri S. N Chakraborty	Tariff Advisory Committee, Madras
Shri B L Choudhry Shri B K Sippy (*Alternate*)	Oil and Natural Gas Commission, Dehra Dun
Shri S. M. Desai	Eureka Firetech Pvt Ltd, Bombay
Shri D. P Dhatrak	Urban Development Department, Govt of Maharashtra, Bombay
Shri S. K Dheri Shri R C. Sharma (*Alternate*)	Municipal Corporation of Delhi, Delhi
Shri Ramesh R Dhoblay	Bhabha Atomic Research Centre (Fire Service), Bombay
Director Deputy Director (*Alternate*)	Home Department (Fire Service), Govt of Tamil Nadu
Director of Equipment Senior Fire Officer (*Alternate*)	National Airport Authority, New Delhi
Director Gen of Fire Service Deputy Director (*Alternate*)	Home (Police Department) Govt of Andhra Pradesh, Hyderabad
Shri C. P. Gosain	CPWD (Electrical), New Delhi
Shri P. N Ghosh	In personal capacity, New Delhi
Shri J. S. Jamshedji Shri C Gnanraj (*Alternate*)	Steelage Industries Ltd (Minimax Division), Bombay
Shri P Khanna	Jaya Shree Textiles & Industries Rishra
Shri D. J. Kulkarni	Municipal Corporation of Greater Bombay (Bombay Fire Brigade), Bombay
Shri S. N. Kundu	Fire & Safety Appliances Co, Calcutta
Managing Director Technical Executive (*Alternate*)	Avon Services (Production and Agencies) Pvt Ltd, Bombay
Shri G B. Menon	In personal capacity (*C-231 Samachar Apartments, Mayur Vihar, Phase I, New Delhi*)
Shri R K Misra Shri Suresh Babu V (*Alternate*)	Steel Authority of India (Bokaro Steel Plant), New Delhi
Shri P. N. Panchal Asstt Inspector Gen (Fire) (*Alternate*)	Central Industrial Security Force, Ministry of Home Affairs
Shri B Pathak	West Bengal Fire Services, Calcutta
President General Secretary (*Alternate*)	The Institution of Fire Engineers (India), New Delhi
Shri R. R. Rao Col V. R. Banahatti (*Alternate*)	Ministry of Defence (DGI)
Shri Harish Selot	Vijay Fire Protection Systems Pvt Ltd, Bombay
Shri U. Sen	Directorate General of Technical Development, New Delhi
Shri P. H Sethna Shri N T Panjwani (*Alternate*)	Kooverji Devshi & Co Pvt Ltd, Bombay
Shri B. J. Shah Shri A. M. Shah (*Alternate*)	Newage Industries, Gujarat
Shri Ashok Sharma Shri A. K. Nandi (*Alternate*)	Mather & Platt (India) Ltd, Bombay
Shri R. C. Sharma	Directorate General of Supplies and Disposals, New Delhi
Dr T. P. Sharma Dr A K Gupta (*Alternate*)	Central Building Research Institute (CSIR), Roorkee
Shri Sunil Das Shri M. C. P. Sinha (*Alternate*)	Metallurgical & Engg Consultants (India) Ltd, Ranchi
Shri Tarit Sur Shri D. Neogi (*Alternate*)	Surex Production & Sales Pvt Ltd, Calcutta
Shri J. N. Vakil Shri K. Ravi (*Alternate*)	Tariff Advisory Committee, Bombay
Shri T. Yogesware Shri John Takey (*Alternate*)	Steel Authority of India Ltd (Rourkela Steel Plant), Rourkela

Fire Fighting Equipment Subcommittee, CED 22 : 2

Convener	*Representing*
Shri G B Menon	In personal capacity, (C 231 *Samachar Apartments, Mayur Vihar, Phase I, New Delhi*)
Members	
Col V. R Banahatti Shri C V Ramachandran (*Alternate*)	Ministry of Defence (DGI)
Shri Ashok Deorah	Real Value Appliances Ltd, Bombay
Director Shri A. K Suri (*Alternate*)	Ministry of Defence (R & D), New Delhi
Shri S K Dheri Shri Surinder Kumar (*Alternate*)	Municipal Corporation of Delhi, Delhi
Fire Adviser	Ministy of Home Affairs, New Delhi
Shri C Gnanraj	Steelage Industries Ltd, Madras
Shri P K John	Directorate of Fire Services, Govt of Goa
Shri D J Kulkarni	Municipal Corporation of Greater Bombay, Bombay
Shri P N Panchal	Central Industrial Security Force (Ministry of Home Affair), New Delhi
President General Secretary (*Alternate*)	The Institution of Fire Engineers (India), New Delhi
Shri K. Ravi Shri O I Gurkha (*Alternate*)	Tariff Advisory Committee, Bombay
Shri H M Sabadra Shri Rajesh Sabadra (*Alternate*)	K V Chemicals, Bombay
Shri Harish Salot Shri Ketan K Salot (*Alternate*)	Vijay Fire Protection System Pvt Ltd, Bombay
Shri P H Sethna Shri N T. Panjwani (*Alternate*)	Kooverji Devshi & Co Pvt Ltd, Bombay
Shri Jitendra Shah	Safex Fire Services, Bombay
Shri J K Shah	Peter Autokits Pvt Ltd, Bombay
Shri Tarit Sur	Surex Production & Sales (P) Ltd, Calcutta

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act* 1986 to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country

Copyright

BIS has the copyright of all its publications No part of these publications may be reproduced in any form without the prior permission in writing of BIS This does not preclude the free use, in the course of implementing the standard, of necessary details, such as symbols and sizes, type or grade designations Enquiries relating to copyright be addressed to the Director (Publications), BIS

Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments Standards are also reviewed periodically, a standard along with amendments is reaffirmed when such review indicates that no changes are needed, if the review indicates that changes are needed, it is taken up for revision Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of '*BIS Catalogue*' and '*Standards Monthly Additions*'

This Indian Standard has been developed from Doc No **CED** 22 (4580)

Amendments Issued Since Publication

Amend No	Date of Issue	Text Affected

BUREAU OF INDIAN STANDARDS

Headquarters

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110 002
Telephones 323 01 31, 323 33 75, 323 94 02

Telegrams Manaksanstha
(Common to all offices)

Regional Offices		Telephone
Central	Manak Bhavan, 9 Bahadur Shah Zafar Marg NEW DELHI 110 002	323 76 17 323 38 41
Eastern	1/14 C I T Scheme VII M, V I P Road, Kankurgachi KOLKATA 700 054	337 84 99, 337 85 61 337 86 26, 337 91 20
Northern	SCO 335-336, Sector 34-A, CHANDIGARH 160 022	60 38 43 60 20 25
Southern	C I T Campus, IV Cross Road, CHENNAI 600 113	254 12 16, 254 14 42 254 25 19, 254 13 15
Western	Manakalaya, E9 MIDC, Marol, Andheri (East) MUMBAI 400 093	832 92 95, 832 78 58 832 78 91, 832 78 92

Branches AHMEDABAD BANGALORE BHOPAL BHUBANESHWAR COIMBATORE FARIDABAD GHAZIABAD GUWAHATI HYDERABAD JAIPUR KANPUR LUCKNOW NAGPUR NALAGARH PATNA PUNE RAJKOT THIRUVANANTHAPURAM

Reprography Unit, BIS, New Delhi, India